PB-300 SERVICE NOTES *First Edition*

SPECIFICATIONS

•Front Panel

RHYTHMS
- ROCK I/WALTZ
- ROCK II/BOSSANOVA
- ROCK III/SAMBA
- DISCO/RHUMBA
- SWING I/CHACHA
- SWING II/BEGUINE
- SLOW ROCK/MARCH
- SHUFFLE/ENKA

BASS

ARPEGGIO

CHORD

HOLD

FILL IN MEASURE
(OFF,2,4,8,12,16)

NUANCE (ON,OFF)

BASS VARIATION (I, II, III)

CHORD/
ARPEGGIO VARIATION (I,II)

TEMPO Control
(♩ = 40 to 280)

Volume Controls
- RHYTHM
- BASS
- CHORD/ARPEGGIO

SYNCHRO START

PLAY/STOP

RHYTHM BREAK

FILL IN

•Rear Panel

CLOCK (EXT,INT)

MIDI IN

MIDI OUT

PLAY/STOP

FILL IN

MIX IN

OUTPUT

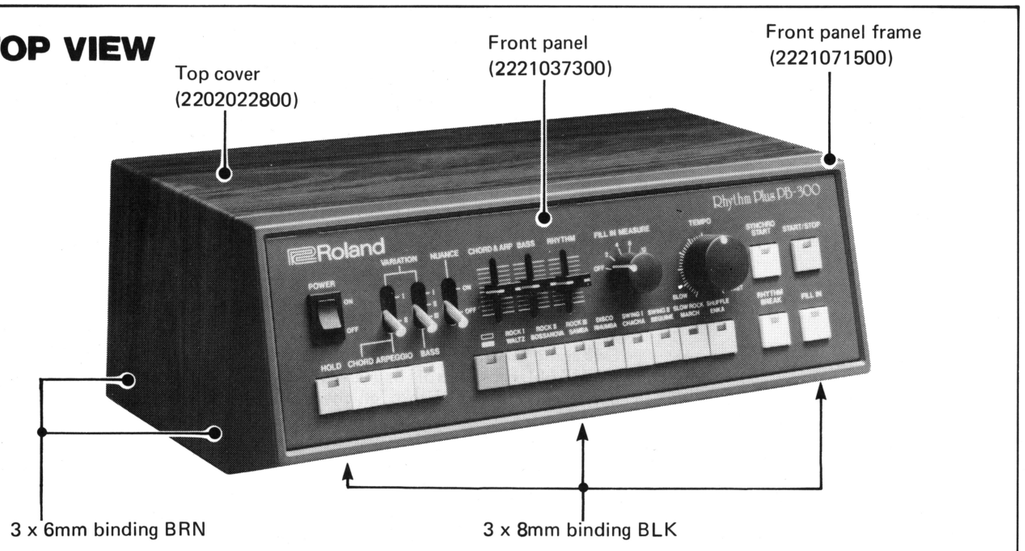
ACCENT LEVEL

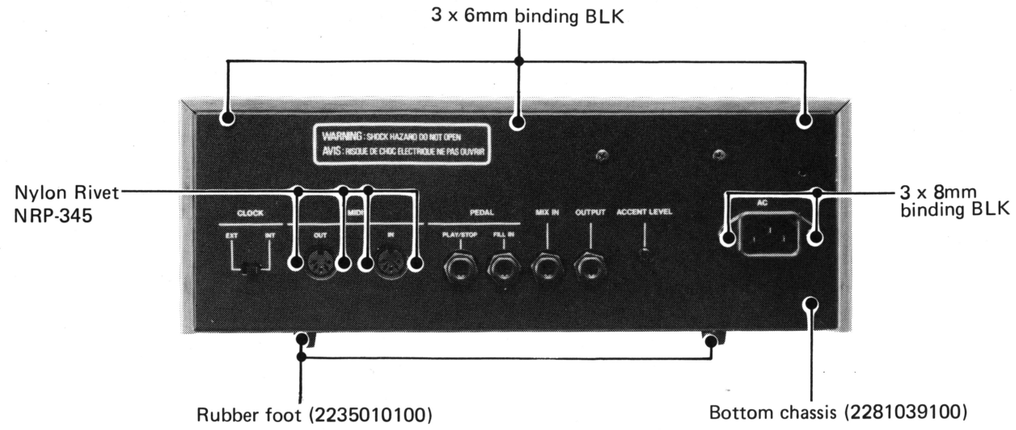
Power Consumption
8W

Dimensions
314(W) x 118(H) x 172(D) mm
12-3/8(W) x 4-5/8(H) x 6-3/4(D) in

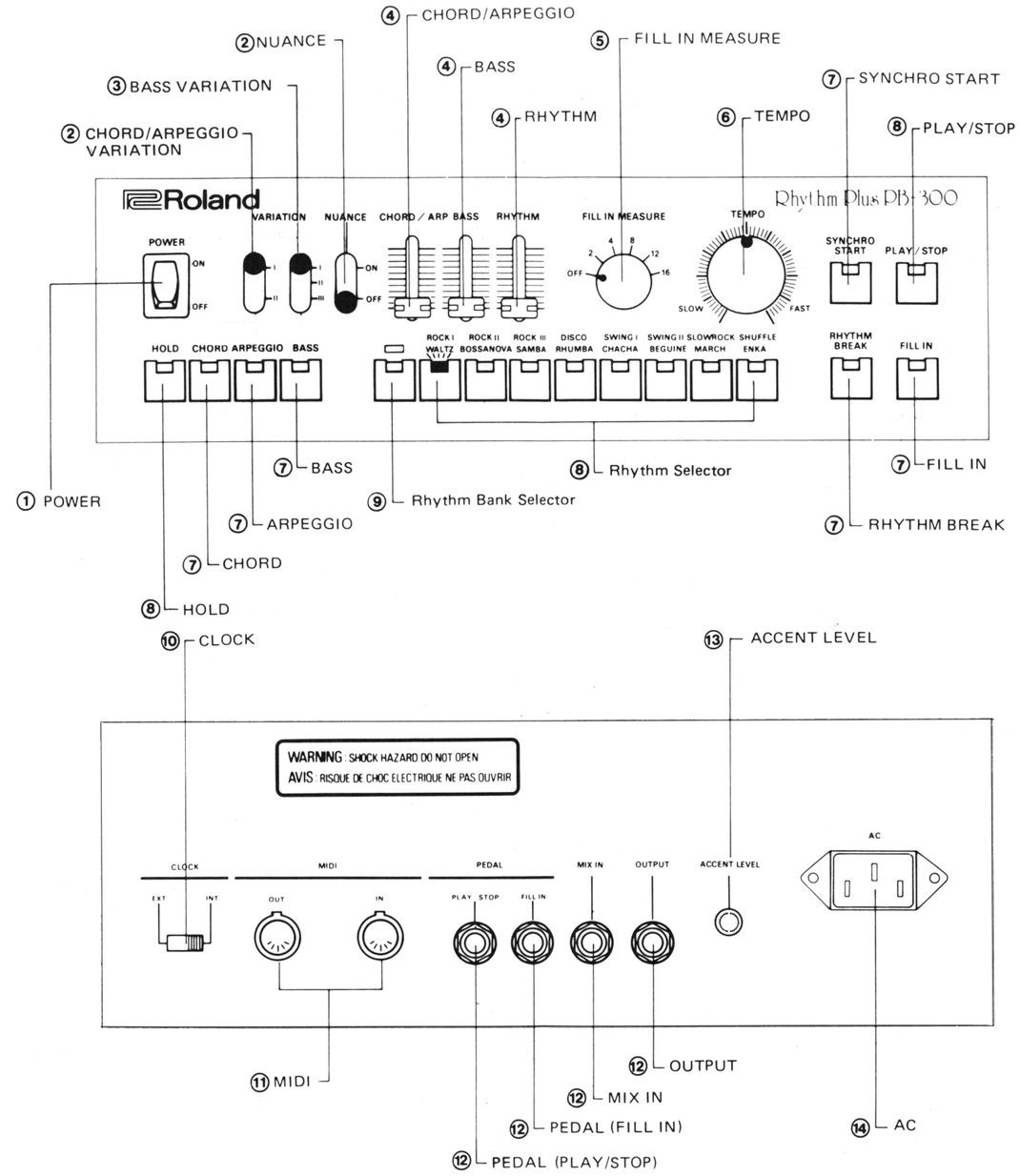
Weight
2.3kg/ 5 lb 1 oz

TOP VIEW





PANEL DESCRIPTIONS



1. Power switch 1801-0121 (13149102)
2. Lever switch SLE622-18P (13139150)
3. Lever switch SLE623-18P (13139135)
4. Slide pot. S2018P405-100kB (13339329)
   Knob (2247025800)
5. Rotary switch SRM1026K15 (13119508)
   Knob (2247020200)
6. Pot. EVH5XAP20B54 50kB (13219241)
   Knob (2247020300)
7. Push switch SPQ009F(13129327)
   LED GL-9HD2 (15029147)
   Button (12479573) ivory
8. Push switch SPQ009F (13129327)
   LED GL-9HD2 (15029147)
   Button (12479575) warm gray
9. Push switch SPQ009F (13129327)
   LED GL-9HD2 (15029147)
   Button (12479574) royal maroon
10. Slide switch SSP-322-9PN (13159111)
11. DIN socket TCS5350-01-1111 (13429615)
12. Jack HLJ4306-01-100 (13449132)
13. Pot. EVH-OTAS10B25 200kB (13219403)
14. AC inlet
    CM-3 (13429708) 100V/240V/240V3P
    PA-126-6.0 (13429710) 117V/220V2P

CIRCUIT DESCRIPTIONS

General Description

The PB-300 is designed for exclusive use with the Roland electronic piano, HP-300 or HP-400. Linking PB-300 with other keyboard including Roland products other than HP-300/400 might bring some minor troubles in musical performance.
The major processes taken in the PB-300 are categorized into three parts as follows.

1. CHORD/ARPEGGIO

Changes a Chord coming from HP into Arpeggio or Auto Chord with tempo timing to the internal rhythm, then sends them back to HP in a MIDI data format.

2. BASS

When BASS on the front panel is ON, changes a lower note(s) data from HP (via MIDI) to a variety of KCVs to be applied to CPU's internal Bass tone generator, which in turn, generates bass line notes in line with the internal rhythm tempo. The bass notes are voiced, level controlled, and then routed to OUTPUT jack as a chain of audio signals.

3. RHYTHM

Can create rhythms independently of MIDI information and sends them out from audio OUTPUT jack.

Detailed Description

1. μPD7811G-033(037)-036 (Microcomputer unit or CPU)

On power up, upon receipt of a low pulse (of approx. 250ms) generated at the RESET circuit (Q13-Q15 and associated components), the CPU will become initialized for its operation. Both 033 and 037 versions are compatible.

PORT	PIN NO.	FUNCTION
7	8	ACCENT trigger out
6	7	BASS DRUM trigger out
5	6	SNARE DRUM trigger out
PA 4	5	LOW TOM trigger out
PORT. A 3	4	HIGH TOM trigger out
2	3	CYMBAL trigger out
1	2	OPEN HI HAT trigger out
0	1	CLOSED HI HAT trigger out
7	16	BASS trigger out
6	15	NC
5	14	RIM SHOT trigger out
PB 4	13	D4. MSB }
PORT. B 3	12	D3. } D/A Converter Data Out
2	11	D2. } VCA Control
1	10	D1. }
0	9	D0. LSB }
7	24	BASS NOTE out
6	23	NC
5	22	CLOCK Select: $\overline{EXT}$/INT
PC 4	21	NC
PORT. C 3	20	Drive Signal to SYNCHRO START LED
2	19	NC
1	18	MIDI IN
0	17	MIDI OUT
7	62	Drive Signal to DISCO, SHUFFLE, HOLD, PLAY/STOP, LEDs
6	61	Drive Signal to ROCKIII, SLOW ROCK, CHORD, FILL IN, LEDs
5	60	Drive Signal to ROCKII, SWINGII, ARP, RHY SEL, LEDs
PD 4	59	Drive Signal to ROCKI, SWINGI, BASS, RHY BREAK, LEDs
PORT D 3	58	}
2	57	} Drive Signal to LEDs,
1	56	} Scanning Signal outputs to switches
0	55	}

PORT	PIN NO.	FUNCTION
7	54	} DISCO, SHUFFLE, HOLD, PLAY/STOP
6	53	} ROCKIII, SLOW ROCK, CHORD, FILL IN
5	52	} Switch Scanning ROCKII, SWINGII, ARP, RHY SEL
PF 4	51	} Signal inputs ROCKI, SWINGI, BASS, RHY BREAK
PORT. F 3	50	} SYNCHRO START
2	49	NC
1	48	NC
0	47	NC
X1 X2		} CPU CLOCK 12.000MHz
7	41	NC
6	40	NC
AN 5	39	ARP/CHORD Level Control
A/D 4	38	TEMPO Control
Converter 3	37	NUANCE Select (ON OFF)
Input 2	36	FILL IN MEASURE Select (OFF, 2, 4, 8, 12, 16)
1	35	ARP/CHORD VARIATION Select (I, II)
0	34	BASS VARIATION Select (I, II, III)
VDD	63	Supply Voltage for RAM +5V
VCC	64	Supply Voltage +5V
VSS	32	GND
AVCC	43	Supply Voltage for A/D Converter +5V
VAREF	42	Reference Voltage for A/D Converter +5V
AVSS	33	GND for A/D Converter
MODE 1	27	INPUT +5V
MODE 0	29	INPUT GND Mode Select of μPD7811AD
INT 1	26	INPUT Interrupt for Key Scanning ⊓⊓ 2ms
$\overline{NMI}$	25	INPUT Non Maskable Interrupt NC +5V
$\overline{WR}$	45	OUTPUT Write Strobe NC
$\overline{RD}$	44	OUTPUT Read Stobe NC
ALE	46	OUTPUT Address Latch Enable NC
$\overline{RESET}$	28	INPUT Reset Active Low Level

2. Interrupt Signal (f = 500Hz)

This is the signal to INT 1 (pin 28) of CPU (μPD7811AD). At the rising edge of the signal, the interrupt program of INT 1 will be started. The program includes the following:

(1) Reading Push button switch events,
(2) Lighting LED,
(3) Triggering each internal sound source,
Only when required of sound out, the corresponding ports among PA0-7 and PB5-7 will become HIGH for 2ms. Usually, they are kept LOW.
(4) Reading the switches and VR settings connected to AN0-5.

The oscillation signals (500Hz) for INT 1 are fed from pin 8 of IC12. Precise frequency of 500Hz can be obtained by adjusting VR-1.

Matrix

The CPU performs push button switch reading and switch-LED lighting through matrix connected to the CPU ports PD and PF. The CPU steps ports PD0-PD3 at INT 1 rate, while turning one of these ports high for 2ms. This period is time shared with both switch scanning and LED lighting. The CPU cycles PD0-PD3 in every 8ms.

3. Push Button Switch Reading

In the example, when PD0 goes high while SW5 is closed, IC12b inverter output goes low, turning its output and PF5 high. This high informs the CPU that PF5 is closed.

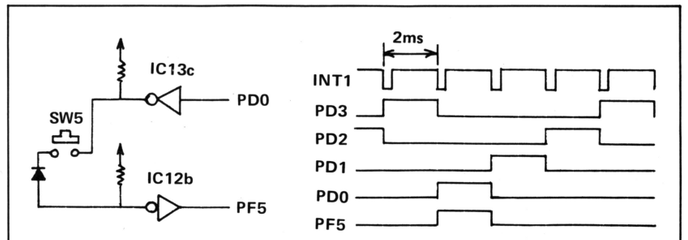


Fig. 1

LED Lighting

Immediately after the key scanning, the CPU puts one of PD4-PD7 low, which corresponds, in number, to one of PF4-PF7 (exception being SYNCHRO START). In the above example, this port is PF5 and the port to be lowered is PD5. When the base of Q6 is forced to low, the LED is illuminated for nearly less than 2ms.
Even after the push button is released, it is software-latched and its mated PD port will be turned low for 2ms intermittently until the switch is overridden by another switch.

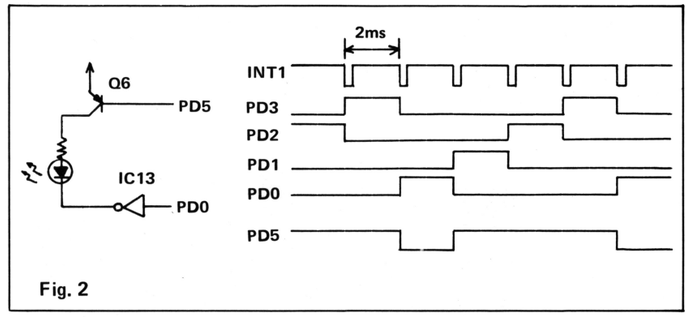


Fig. 2

4. Reading Switches connected to AN0-5 (6, 7 . . . . . NC)

Switching BASS Variation Control, ARP/CHORD Variation Control, FILL IN MEASURE Control, or NUANCE ON/OFF Control is sensed as the voltage level by the CPU through these ports and then sent into the internal A/D converter.

5. TEMPO Control

PB-300 provides for a clock generator inside the CPU for use in controling the pattern tempo of RHYTHM, BASS or CHORD/ARPEGGIO. By turning TEMPO VR4 placed outside of CPU, DC input voltage to AN4 can be adjusted of its level. The DC voltage, upon entering to CPU via AN4, is converted to digital form through the internal A/D converter. With this digital data, CPU calculates the count value and with the value obtained it sets the TIMER.
Through the TIMER, it achieves TEMPO Control. (Adjustable clock range equivalent to TEMPO is . . . . . ♩ = 40-280 approx.)

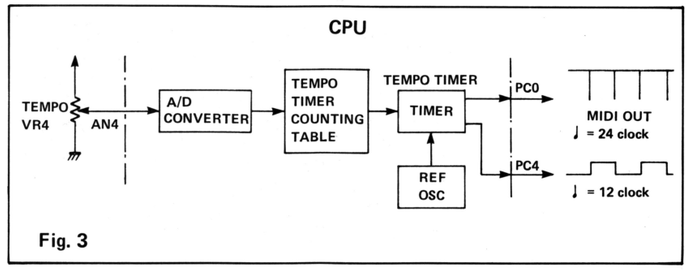


Fig. 3

6. Rhythm Sound Sources

Circuit constructions of various sound sources such as HI TOM, LOW TOM, SD, BD, RS, are shown in Fig. 4 and those of CY, OH, and CH are in Fig. 5 shown below:

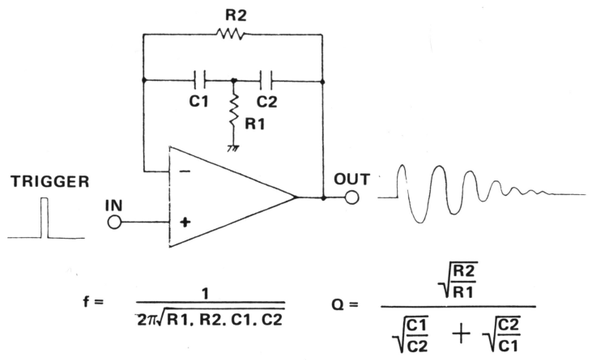


Fig. 4 Representative Bridged N-Net work

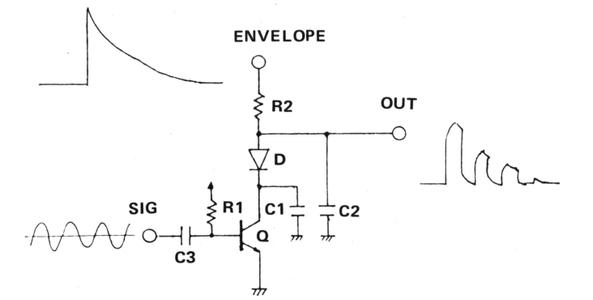


Fig. 5 Representative Swing Type VCA

7. BASS Sound

PB-300 utilizes the CPU's internal TIMER as an oscillator to generate BASS Notes. The signals from the oscillator for BASS Note are taken from CPU via PC7 (Pin 24).

When PB-300 is played with BASS switch on, it progresses the development of BASS line in accordance with a combination of the keys pressed, which is received via MIDI IN. The varying data of BASS Notes are sent from CPU via PC7 to Q4 of Voicing board, where bass tone is gated when TRIG from PB7 (Pin 16) is applied to Q2 at a certain rhythm tempo. Having colored while passing through IC1a and Q1 (LPF), bass tone is routed to BASS VOL CONT VR2.

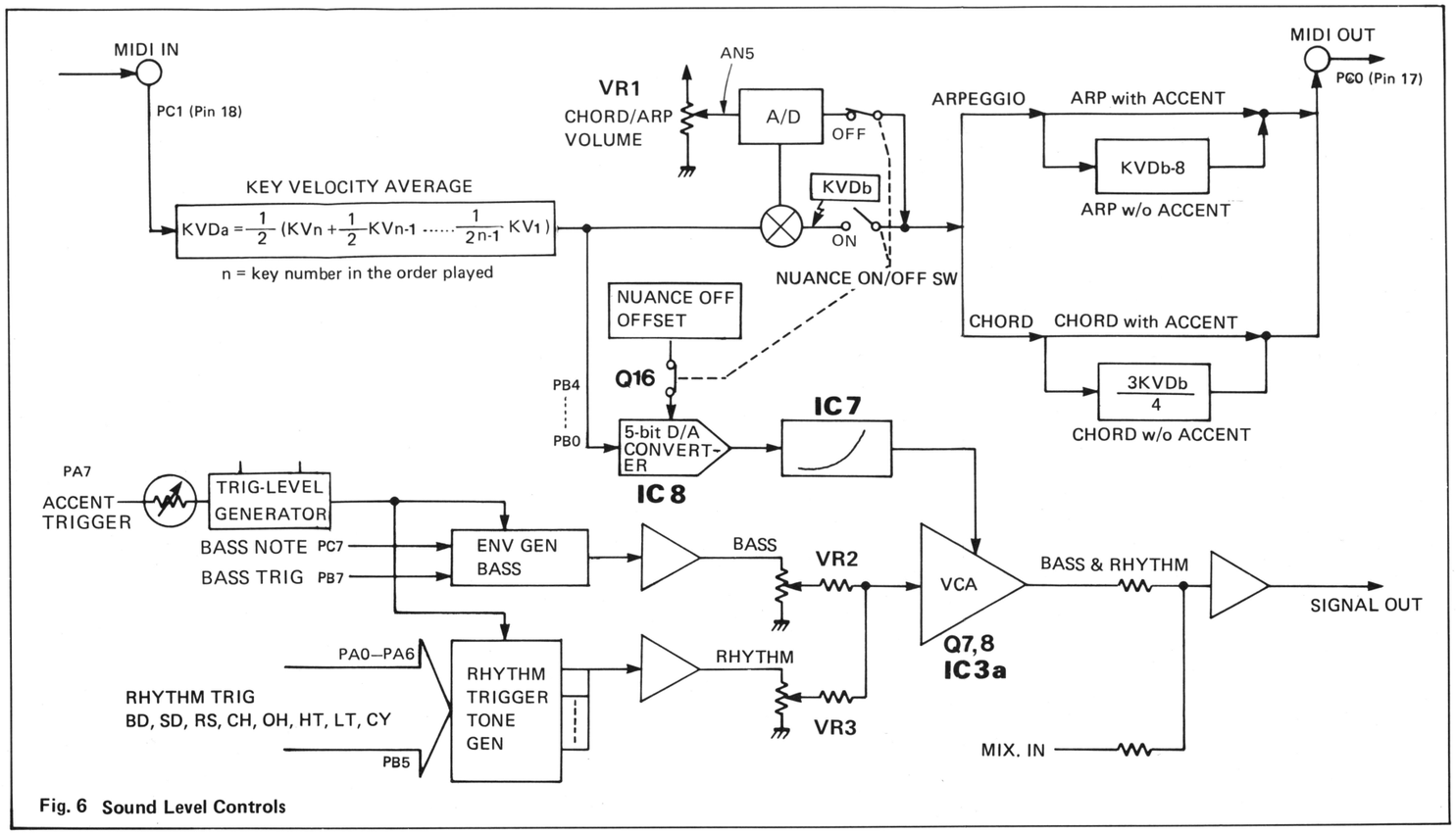


Fig. 6 Sound Level Controls

8. BASS and RHYTHM Total Level Control

Beside BASS VOL and RHYTHM VOL, there is another VCA (Q7, Q8 and IC3a) to control these sound levels with key velocity data contained in MIDI information. This function however, can be made optional by the switching of NUANCE on the PB-300 front panel.

NUANCE OFF

When NUANCE is OFF, the CPU ignores key velocity and turns PB0-PB4 high. NUANCE switch also applies a high to the base of Q16, which in turn pulls MSB of the D/A (IC8) to ground. With this D/A output applied, the output from exponential converter IC7a sets the VCA to about 2/3 of its full gain, the gain that minimizes the amplitude difference between NUANCE switchings.

NUANCE ON

Each key velocity data of lower range, received through MIDI IN, is always added to previously summed key velocity data using equation KVDa as shown in the figure. This equation explains that each key touch does not affect directly, immediately VCA gain, rather it is reflected on the average of plural keys and is converted into analog voltage at the time Bass or Rhythms are reproduced. During NUANCE ON, Q16 is OFF. Note that in the figure MIDI IN channel represents only key velocity data for clarity.

9. ARP/CHORD Level Control

The PB-300 has no sound source for ARP/CHORD, but modifies those of HP-300/400 received through MIDI IN: PB-300 converts a chord into an arpeggio or times the chord to the rhythm. The following description will deal with only the process in which key velocity data are used to control chord or arpeggio sound volume. The process analogous to the situation described under the above section.

NUANCE OFF

MIDI IN Key Velocity message is disconnected from the Chord/Arpeggio circuitry which determines the sound level in relation to the setting of CHORD/ARP VOL VR1. This means that the PB-300 can transmit its own key velocity message over MIDI OUT independently of MIDI IN key velocity message.

NUANCE ON

The voltage set by VR1 is A/Ded and mixed with an averaged key velocity data KVDa to become new key velocity data (KVDb) for MIDI OUT.

10. MIDI IN and MIDI OUT

MIDI Bus (for communication of key event data, etc., with HP-300/400) is of the construction illustrated below:

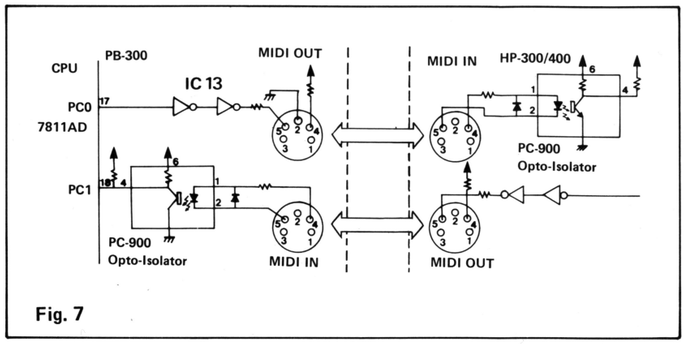


Fig. 7

From CPU, the key event data are output through PC0 (Pin 17) and, via IC13 of an open collecter, onto MIDI OUT Jack. When there is no data to be transmitted,PC0 is held HIGH.

Conversely, when the MIDI data are coming from external sources, they are fed through MIDI IN, to PC-900 of the opto-isolator, (IC1 of JACK BOARD) and after being converted to 0 or +5V, the data, via pin 4 of PC-900, are input to PC1 (Pin 18) of CPU.
When no data are on MIDI IN, PC1 is held HIGH.

MIDI Bus has those hardware characteristics as listed below:

1. The circuit forms a 5 mA current loop. (one MIDI OUT can drive only one MIDI IN.)
2. When current is flowing, the state is taken as logical 0.
3. Interface is serial, operating at 31.25 KBaud.
4. Type is of asychronous. One frame consists of a total 10 bits as follows:
   Start bit . . . . . 1 bit (Low Level)
   Data bits . . . . . 8 bits (D0 - D7)
   Stop bit . . . . . 1 bit (High Level)

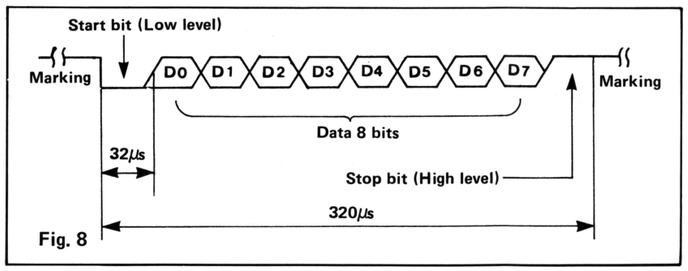


Fig. 8

For further detail of MIDI Specification, refer to the "MIDI Information" issued separately.

11. Notes in MIDI Connection between PB-300 and HP-300/400

Due to design configurations of PB-300 and HP-300/400, transmission of key events will be restricted in some aspects. In AUTO CHORD or ARPEGGIO mode, PB-300 does not send key event data as they entered. Natually, it will shift some key notes, rearrange chord components, add Arpeggio pattern, and/or time the output notes to rhythm patterns. Consequently, some discrepancies may exist between MIDI IN and MIDI OUT information.

1. Key events, which fall within the range below PB-300's key split point and have been received through MIDI IN on CH 1, are not transmitted out of the MIDI OUT when PB-300 is played in either AUTO CHORD or ARPEGGIO mode.
2. If PLAY/STOP button on the PB-300 is activated while lower keys are being held down with AUTO CHORD or ARPEGGIO ON, ON or OFF of key events will differ between the keyboard and some of the reproduced notes on HP-300/400.
3. In AUTO CHORD or ARPEGGIO mode, a key played on the lower range will be shifted up by 2 octaves and may overlap the 2-oct-high key that is being actually played. Under this condition, both key events are ORed anywhere in the PB-300 circuit, resulting in the loss of one of the key OFF events. See figure below.

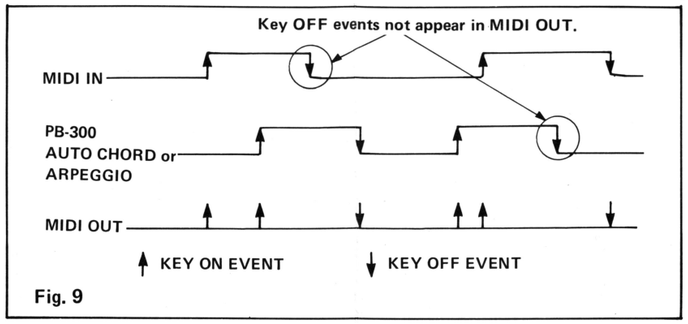


Fig. 9

PB-300 MIDI IMPLEMENTATION (Ver 1.0)

RECOGNIZED RECEIVE DATA IN OMNI MODE

Status	Second	Third	Description
1000xxxx	0kkkkkkk	0vvvvvvv	Note Off Event
			kkkkkkk = 0 - 127
			vvvvvvv = 0 - 127
			xxxx = 0 - 15
1001xxxx	0kkkkkkk	0vvvvvvv	Note On
		00000000	Note Off
			kkkkkkk = 0 - 127
			Note On
			vvvvvvv = 1 - 127
			Note Off
			vvvvvvv = 0
10110000	01111111	0xxxxxxx	All Notes Off
			POLY Mode Select
10110000	01111110	0xxxxxxx	All Notes Off
			MONO Mode Select (as OMNI)
10110000	01111101	0xxxxxxx	All Notes Off
			OMNI Mode Select
11111000			Clock-in-play
11111010			Start-at-1st-measure
11111011			Continue-start
11111100			Stop

RECOGNIZED RECEIVE DATA IN POLY MODE

Status	Second	Third	Description
10000000	0kkkkkkk	0vvvvvvv	Note Off
		00000000	kkkkkkk = 0 - 127
			vvvvvvv = 1 - 127
10010000	0kkkkkkk	0vvvvvvv	Note On
			Note Off
			kkkkkkk = 0 - 127
			vvvvvvv = 0 - 127
10110000	01111111	0xxxxxxx	All Notes Off
			POLY Mode Select
	01111110	0xxxxxxx	All Notes Off
			MONO Mode Select (as OMNI)
	01111101	0xxxxxxx	All Notes Off
			OMNI Mode Select
11111000			Clock-in-play
11111010			Start-at-1st-measure
11111011			Continue-start
11111100			Stop

TRANSMITTED DATA

Status	Second	Third	Description
10010000	0kkkkkkk	0vvvvvvv	Note On
		00000000	Note Off
			kkkkkkk = 21 - 108
			vvvvvvv = 1 - 127
10110000	01111111	00000000	All Notes Off
			POLY Mode Select
11111000			Clock-in-play
11111010			Start-at-1st-measure
11111011			Continue-start
11111100			Stop

PR-800 MIDI IMPLEMENTATION (Ver 1.0)

RECOGNIZED RECEIVE DATA IN OMNI MODE

Status	Second	Third	Description
1000xxxx	0kkkkkkk	0vvvvvvv	Note Off
			kkkkkkk = 0 - 117
			vvvvvvv = 0 - 127
			xxxx = 0 - 15
1001xxxx	0kkkkkkk	0vvvvvvv	Note On
		00000000	Note Off
			kkkkkkk = 0 - 117
			vvvvvvv = 1 - 127
1011xxxx	01000000	01111111	Damper On
		00000000	Damper Off
1011xxxx	01000001	01111111	Soft On
		00000000	Soft Off
1011xxxx	01000010	01111111	Sostenuto On
		00000000	Sostenuto Off
1011xxxx	01000011	01111111	SW4 (UD) On
		00000000	SW4 (UD) Off
10110000	01111111	0xxxxxxx	All Notes Off
			POLY Mode Select
10110000	01111110	0xxxxxxx	All Notes Off
			MONO Mode Select
10110000	01111101	0xxxxxxx	All Notes Off
			OMNI Mode Select
1100xxxx	0ppppppp		Program Change
			ppppppp = 0 - 127
11111000			Clock-in-play
11111010			Start-at-1st-measure
11111011			Continue-start
11111100			Stop

RECOGNIZED RECEIVE DATA IN POLY MODE

Status	Second	Third	Description
10000000	0kkkkkkk	0vvvvvvv	Note Off
			kkkkkkk = 0 - 127
			vvvvvvv = 0 - 127
10010000	0kkkkkkk	0vvvvvvv	Note On
		00000000	Note Off
			kkkkkkk = 0 - 127
			vvvvvvv = 1 - 127
10110000	01000000	01111111	Damper On
		00000000	Damper Off
10110000	01000001	01111111	Soft On
		00000000	Soft Off
10110000	01000010	01111111	Sostenuto On
		00000000	Sostenuto Off
10110000	01000011	01111111	SW4 (UD) On
		00000000	SW4 (UD) Off
10110000	01111111	0xxxxxxx	All Notes Off
			POLY Mode Select
			xxxxxxx Any Value
10110000	01111110	0xxxxxxx	All Notes Off
			MONO Mode Select (as OMNI)
10110000	01111101	0xxxxxxx	All Notes Off
			OMNI Mode Select
11000000	0ppppppp		Program Change
			ppppppp = 0 - 127
11111000			Clock-in-play
11111010			Start-at-1st-measure
11111011			Continue-start
11111100			Stop

TRANSMITTED DATA

Status	Second	Third	Description
10010000	0kkkkkkk	0vvvvvvv	Note On
		00000000	Note Off
			kkkkkkk = 21 - 108
			vvvvvvv = 1 - 127
10110000	01000000	01111111	Damper On
		00000000	Damper Off
10110000	01000001	01111111	Soft On
		00000000	Soft Off
10110000	01000010	01111111	Sostenuto On
		00000000	Sostenuto Off
10110000	01000011	01111111	SW4 (UD) On
		00000000	SW4 (UD) Off
10110000	01111111	00000000	All Note Off
			POLY Mode Select
11000000	0ppppppp		Program Change
			ppppppp = 0 - 127
11111000			Clock-in-play
11111010			Start-at-1st-measure
11111011			Continue-start
11111100			Stop

HP-300/400 MIDI IMPLEMENTATION

TRANSMITTED DATA

Status	Second	Third	Description
1001 0000	0kkk kkkk	0vvv vvvv	Note On
		0000 0000	Note Off
			kkk kkkk = 29 - 103 (HP-300)
			21 - 108 (HP-400)
			vvv vvvv = 1 - 127
1011 0000	0100 0000	0111 1111	Damper On
		0000 0000	Damper Off
1011 0000	0100 0001	0111 1111	Soft On
		0000 0000	Soft Off
1011 0000	0111 1111	0000 0000	All Notes Off
			POLY Mode Select

RECOGNIZED RECEIVE DATA IN OMNI MODE

Status	Second	Third	Description
1000 xxxx	0kkk kkkk	0vvv vvvv	Note Off
			kkk kkkk = 0 - 127 (21-108)
			vvv vvvv = 0 - 127
			xxxx = 0 - 15
1001 xxxx	0kkk kkkk	0vvv vvvv	Note On
		0000 0000	Note Off
			kkk kkkk = 0 - 127 (21-108)
			vvv vvvv = 1 - 127
1011 xxxx	0100 0000	0111 1111	Damper On
		0000 0000	Damper Off
1011 xxxx	0100 0001	0111 1111	Soft On
		0000 0000	Soft Off
1011 0000	0111 1111	0xxx xxxx	All Notes Off
			POLY Mode Select
			xxx xxxx any value
	0111 1110	0xxx xxxx	All Notes Off
			MONO Mode Select (as OMNI)
	0111 1101	0xxx xxxx	All Notes Off
			OMNI Mode Select

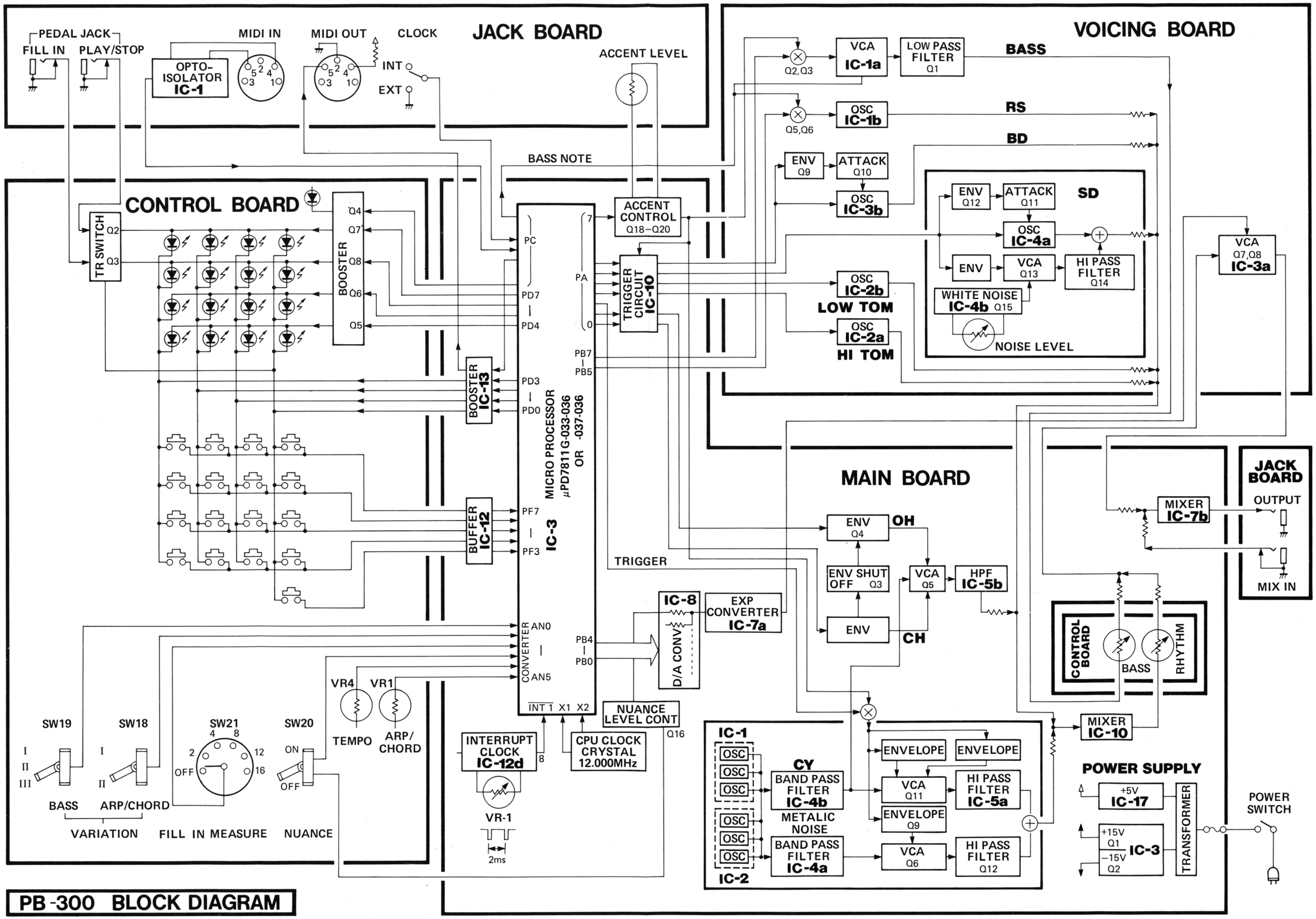
RECOGNIZED RECEIVE DATA IN POLY MODE

Status	Second	Third	Descrption
1000 0000	0kkk kkkk	0vvv vvvv	Note Off
			kkk kkkk = 0 - 127 (21-108)
			vvv vvvv = 0 - 127
1001 0000	0kkk kkkk	0vvv vvvv	Note On
			Note Off
			kkk kkkk = 0 - 127 (21-108)
			vvv vvvv = 1 - 127
1011 0000	0100 0000	0111 1111	Damper On
		0000 0000	Damper Off
1011 0000	0100 0001	0111 1111	Soft On
		0000 0000	Soft Off
1011 0000	0111 1111	0xxx xxxx	All Notes Off
			POLY Mode Select
	0111 1110	0xxx xxxx	All Notes Off
			MONO Mode Select (as OMNI)
	0111 1101	0xxx xxxx	All Notes Off
			OMNI Mode Select

Notes:

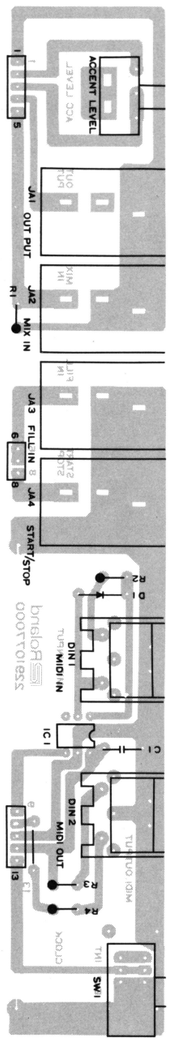
1. The transmitter sends All Notes Off code when all the keys are released.
2. The received notes outside the HP-400 keyboard range will be shifted by octave(s) to fall within the range.

BLOCK DIAGRAM



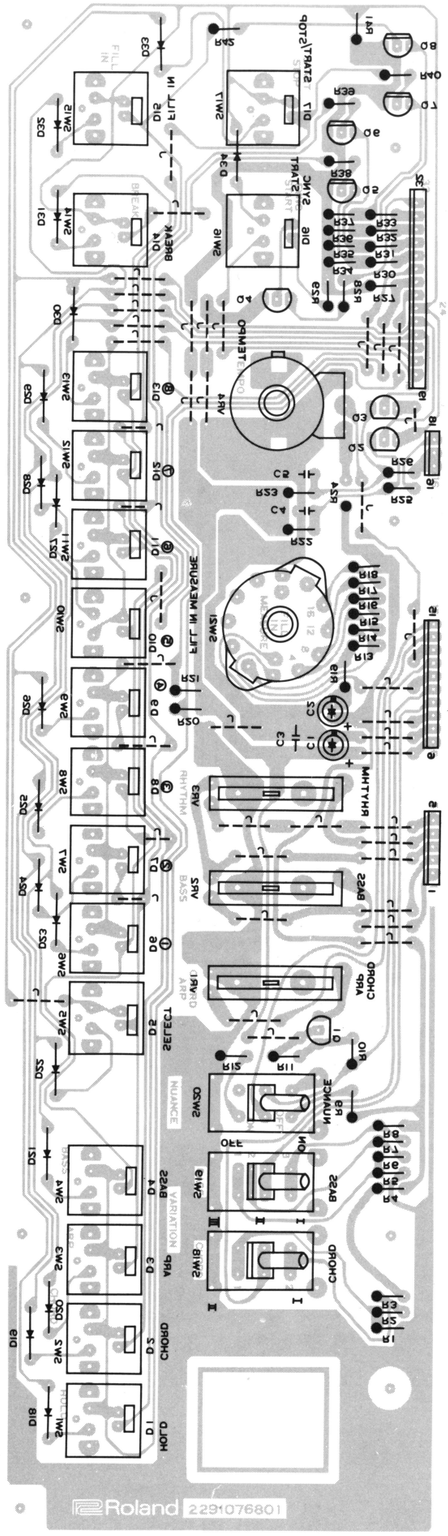
PB-300 BLOCK DIAGRAM

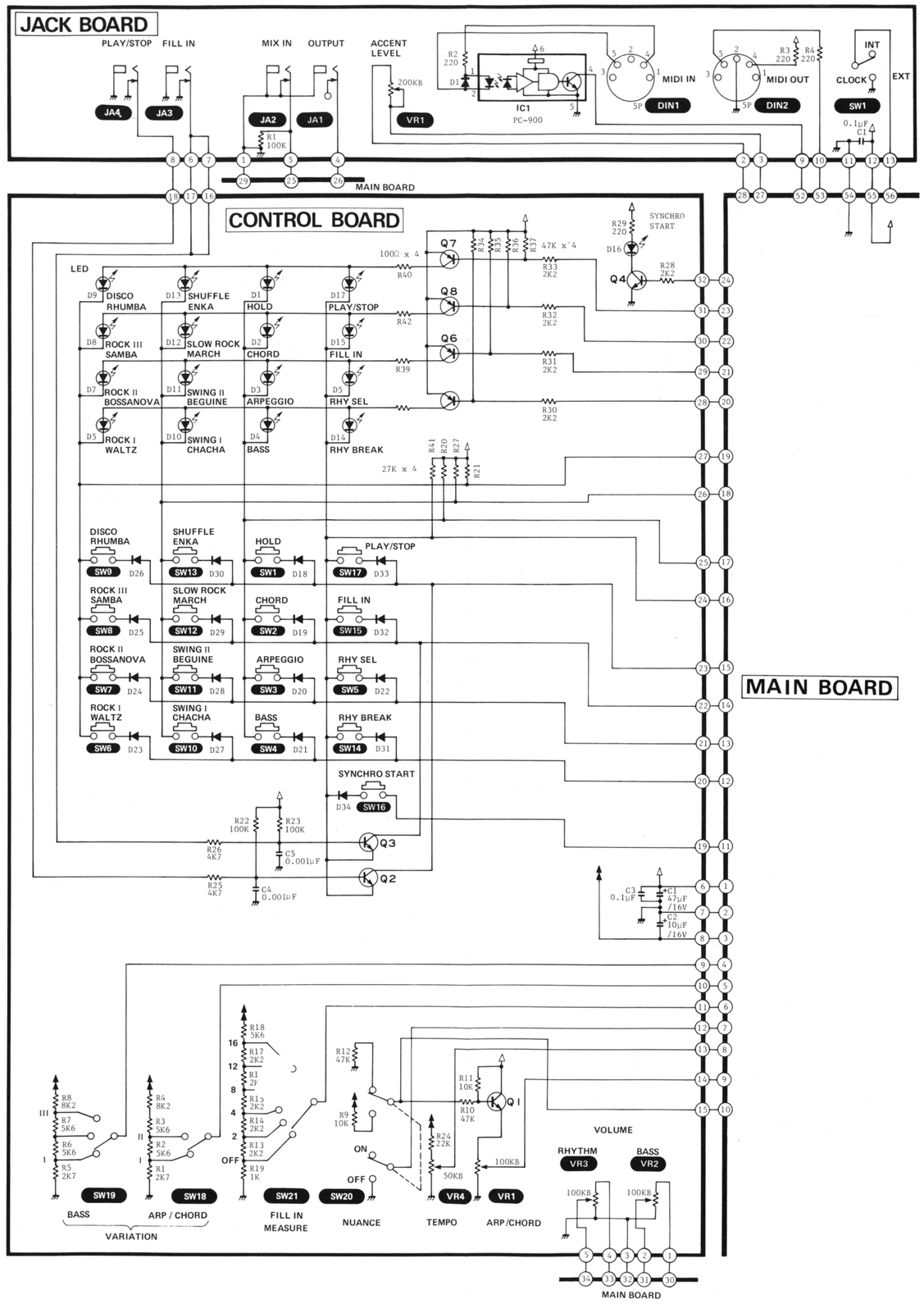
JACK BOARD
(7931410001)
(pcb 2291077000)



CONTROL BOARD
(7931409002)
(pcb 2291076801)

View from foil side

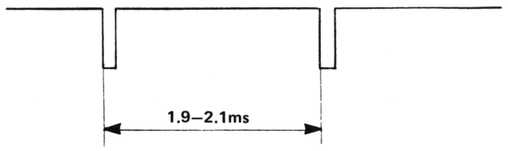




ADJUSTMENT

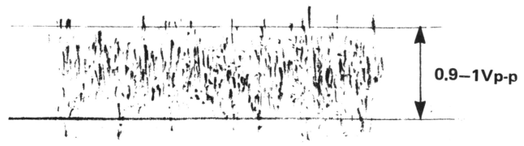
1. INT 1 FREQUENCY

1-1. Connect the oscilloscope to pin 8 of IC12d on MAIN BOARD.
1-2. Adjust VR1 for 1.9-2.1ms/cycle.

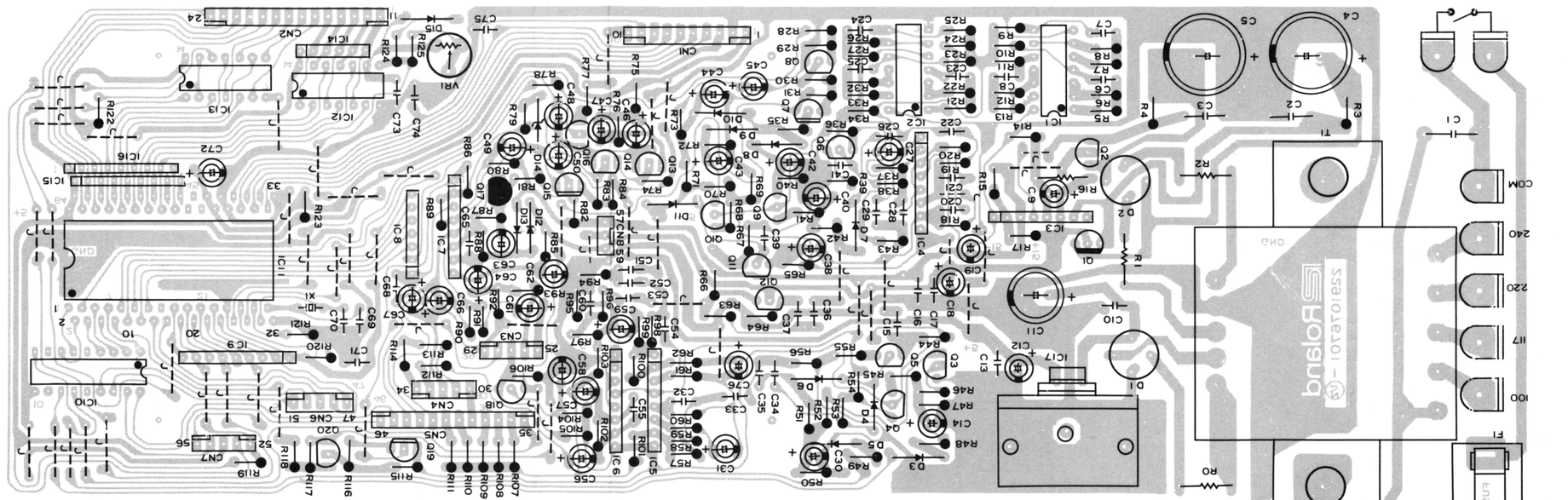


2. NOISE LEVEL

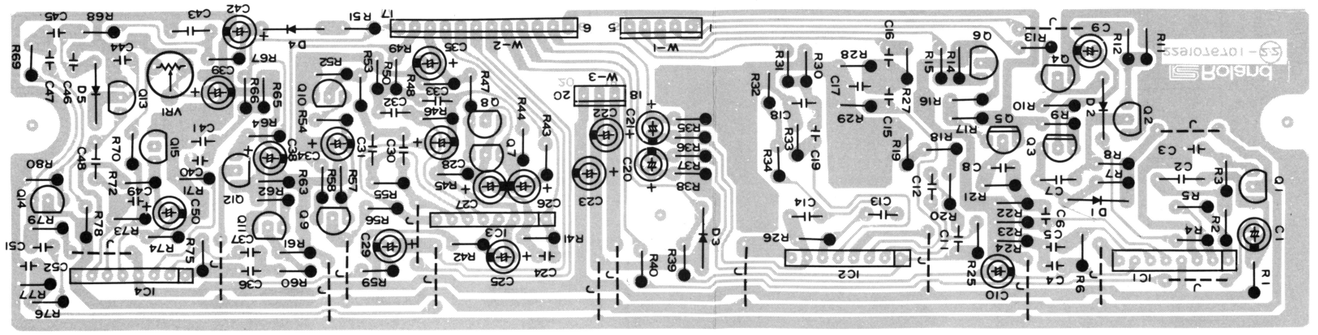
2-1. Connect the scope to pin 7 of IC4b on VOICING BOARD.
2-2. Adjust VR1 (NOISE LEVEL) for 0.9-1Vp-p amplitude.



MAIN BOARD
(7931406001)
(pcb 2291076700–1/2)

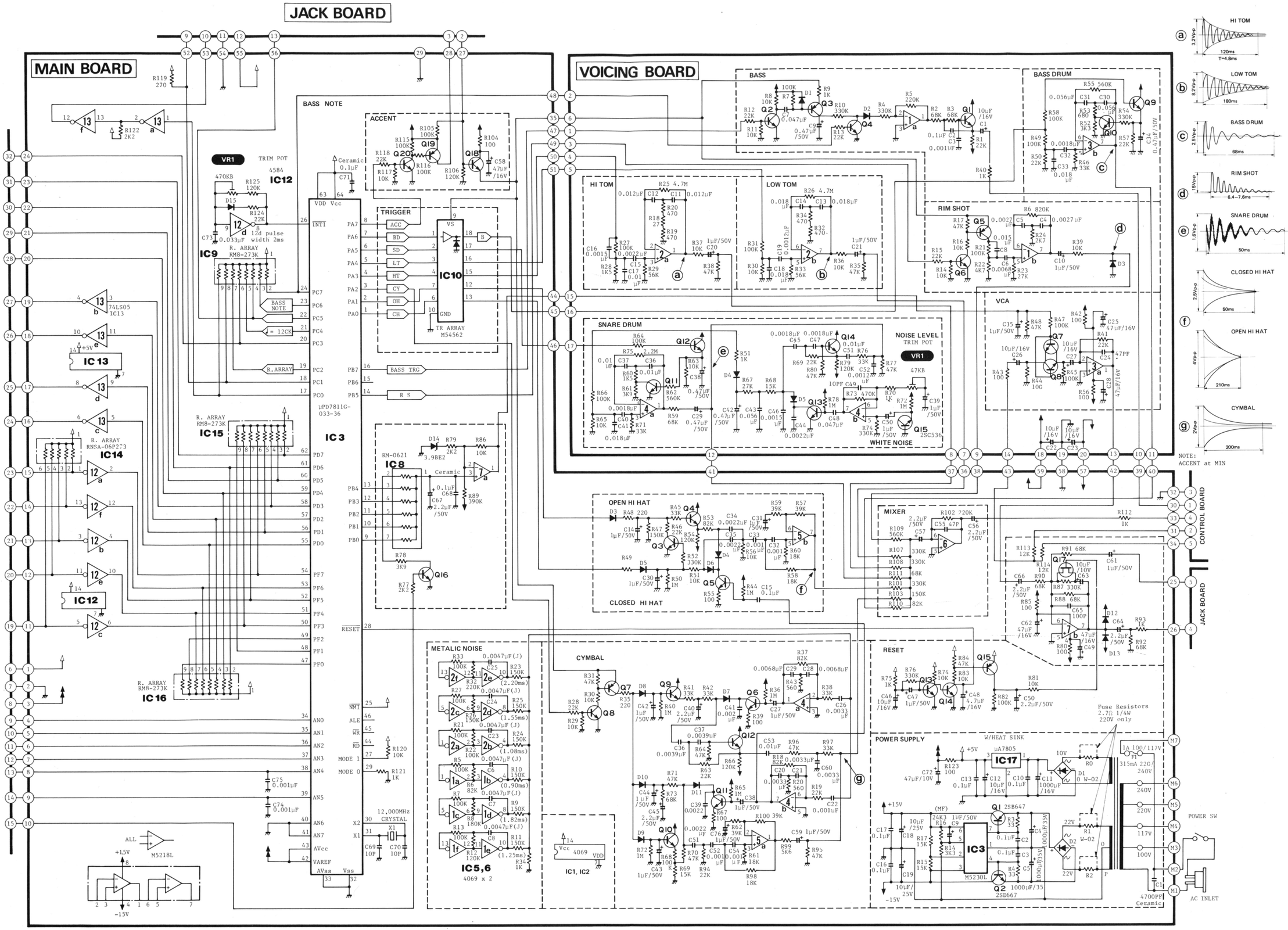


VOICING BOARD
(7931408001)
(pcb 2291076700–2/2)



	100/117V	220/240V
F1	SGA 1A	T315mA
R0	fuse	jumper
R1	resistor	
R2	2.7Ω 1/4W	

CIRCUIT DIAGRAM



PARTS LIST

PANEL

2221037300	Front panel	
2221071500	Front panel frame	
2202022800	Top cover	
2281039100	Bottom chassis	

KNOB, BUTTON

12479574	Button	W/LED (Royal maroon)
12479575	Button	W/LED (Warm gray)
12479573	Button	W/LED (Ivory)
2247020300	Knob	TEMPO (Gray)
2247020200	Knob	FILL IN MEASURE (Gray)
2247025800	Knob	RHYTHM, BASS, ARP/CHORD Level (Black)

PCB ASSEMBLY

7931406001	MAIN BOARD	(pcb 2291076700-1/2)
7931408001	VOICING BOARD	(pcb 2291076700-2/2)
7931409002	CONTROL BOARD	(pcb 2291076800)
7931410001	JACK BOARD	(pcb 2291077000)

TRANSFORMER, CRYSTAL

22450346U0	Power transformer 245-346U	
12389717	Crystal 12.000MHz	

FUSE, FUSE HOLDER, FUSE RESISTOR

12499519	TF-758	Fuse holder
12559105	SGA1A	Fuse 1A 100,117V
12559509	CEE-T315mA	Fuse 315mA 220,240V
12559708	FRNB 2.7 1/4W	Fuse resistor

SOCKET, JACK

13429708	CM-3 (AC inlet) 3P	100,240V
13429710	PA-126-6.0 (AC inlet) 2P	117,220V
13429615	TCS5350-01-1111 (DIN socket)	
13449132	HLJ4306-01-100 (Jack)	

SWITCH

13149102	1801-0121 (Power)	
13139135	SLE623-18P (Lever)	BASS VARI
13139150	SLE622-18P (Lever)	ARP/CHORD VARI NUANCE
13159111	SSP-322-9PN (Slide)	CLOCK
13129327	SPQ009F (Push)	W/LED
13119508	SRM1026K15 (Rotary)	FILL IN MEASURE

POTENTIOMETER

13219241	EVH5XAP20B54 50KB	TEMPO
13339329	S2018P405-100KB	RHYTHM, BASS ARP/CHORD
13219403	EVH-0TAS10B25 200KB	ACCENT
13299116	H1051A016-47KB Trimmer 47KB	Noise
13299122	H1051A023-470KB Trimmer 470KB	Interrupt

IC

15179149 or 15179176	μPD7811G-033-036 or μPD7811G-037-036 Minor program change, compatible	NMOS CPU
15169334H0	HD74LS05P	TTL
15159303H0	HD14584B	CMOS
15159116T0	TC4069UBP	CMOS
15199106	UA7805UC	+5V Regulator
15199117	M5230L	+/-15V Regulator
15189136	M5218L	Dual OP amp
15149110	M54562	TR array
15229712	PC-900	Photo coupler (Opto isolator)

TRANSISTOR

15129114	2SC1815-GR		NPN
15129602	2SD667C		NPN
15119113	2SA1015-GR		PNP
15119602	2SB647C		PNP
151291080A	2SC536F	(selected for noise)	NPN
15139103	2SK30ATM-GR		FET

DIODE

151019103	1S2473	
15019634	RD-3.9EB-2	3.9V Zener
15019236	W-02	Rectifier stack

LED

15029147	GL-9HD2	Red

CAPACITOR

13529104	DE7150F472MVA1	4700PF

RESISTOR ARRAY

13910102	RNSA-09P273	27K x 8
13919133	RM-0621	
13919138	RNSA-06P273	27K x 5

CONNECTOR

13439119	5045-03A(MOLEX)	MAIN BOARD
13439121	5045-05A(MOLEX)	MAIN BOARD
13439126	5045-10A(MOLEX)	MAIN BOARD
13439155	5045-12A(MOLEX)	MAIN BOARD
13439164	5045-14A(MOLEX)	MAIN BOARD
13439119	5045-03A(MOLEX)	JACK BOARD
13439202	3024-03CH	MAIN BOARD

WIRING ASS'Y

2341041900	3P CONTROL BOARD
2341043600	5P CONTROL BOARD
2341043700	10P CONTROL BOARD
2341043900	14P CONTROL BOARD
2341043500	3P VOICING BOARD
2341043600	5P VOICING BOARD
2341043800	12P VOICING BOARD
2341043600	5P JACK BOARD

AC CORD SET

13439816F0	DC-357-J01	100V
13439812F0	VC-704-J01	117V
13439813F0	EC-210-J06	220V 2P
13439817F0	EC-702-J05	240V 2P
13439814F0	SC-415-J06	(Australia) 240V3P

OTHERS

2224012900	Lever switch mask
2246010500	Heat sink t 2.0AL
2235010100	Rubber foot

COMMERCIALLY AVAILABLE ACCESSORIES

2343575900	DIN Cable	5P DIN W/L plug
2343067500	Connection Cable	LP-25